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Analysis of Floor Work Design in Ceramic Factory Building Expansion Project PT, Surya Multi Cemerlang

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ABSTRACT: The development of science and technology must be followed by an increase in the quality of quality Human Resources (HR), who think and act practically and efficiently. It is expected that quality Human Resources (HR) can be born from Universities in Indonesia. Surabaya State University is one of the institutions for the study and development of science, which plays a role in preparing professional workers. Not only equipping students with theoretical knowledge alone, but also equipped with practicums and internship activities as a means of training and skills for various fields according to the majors of each student. Internship Work Practice aims for students to be able to distinguish between the theory obtained in the lecture hall and field work practice, and to be able to think critically, logically, conceptually and applicatively as well as professionally in their fields. In this case, in the Building Engineering Education Study Program, Internship Work Practice is one of the requirements to complete the semester VI courses which are carried out for approximately 4 months in the field, namely the implementation starting from February 14, 2024 to June 14, 2024.

To meet these requirements, the author and several fellow students conducted an Internship Work Practice . This Internship Work Practice activity was carried out at the PT Surya Multi Cemerlang ceramic factory, precisely at Jl. Raya Semambung No.296, Semambung-Wonoayu, Sidoarjo with PT Bangun Karya Perkasa Jaya Tbk as the Implementing Contractor. In connection with the many types of work on the Ceramic Factory Building Expansion Project (PT. Surya Multi Cemerlang) in Wonoayu, Sidoarjo, the types of work reviewed are limited to reviewing only the main activities, namely Floor Plate Work.

One of the important structural elements in this project is the Floor Plate. As a structural element that functions as a place to support human and object loads, the Floor Plate is very influential in the planning and implementation of building construction. In its planning and implementation, the Floor Plate is designed as well and optimally as possible so as not to cause discomfort or danger. Improper planning and implementation of Floor Plate construction can cause cracks in one piece, which can affect the quality and durability of the floor plate. There are several students who review the implementation of other structural work from several areas being worked on by PT Bangun Karya Perkasa Jaya, such as reviewing the implementation of pile work, reviewing the implementation of Machine Foundation work, and reviewing the implementation of Wall work. Therefore, in the practical work that has been carried out, the author decided to analyze the method of "implementing Floor Plate work in the construction of a ceramic factory" in the field for writing the practical work report.

KEYWORDS: building expansion project, Pt. Surya Multi Cemerlang, design analysis, factory building design, granite

1. INTRODUCTION

Building analysis design is a process that involves evaluating, planning, and developing a building structure to ensure its strength, stability, and functionality. The process involves a variety of steps, from understanding user needs and analyzing environmental conditions, to designing technical details and selecting appropriate materials. Here are some of the key aspects of building analysis design:

1. Needs Analysis: Identifying the needs and objectives of the building project, including the primary use, capacity, and required technical specifications.

2. Feasibility Study: Evaluating the project's economic, technical, and environmental feasibility. This includes analyzing costs, benefits, environmental impacts, and local regulations.

3. Structural Design: Developing a structural design that ensures the building is capable of supporting the loads applied, including dead loads (the building's own weight), live loads (occupants and equipment), and environmental loads (wind, earthquakes).

4.Material Selection: Selecting appropriate construction materials based on strength, durability, cost, and environmental impact.

5. Simulation and Modeling: Using simulation software to model and test the structural design under various conditions to ensure safety and reliability.

6 Energy Analysis: Evaluation of a building's energy efficiency to ensure optimal use of resources and compliance with energy efficiency standards.

7 Code and Regulatory Compliance: Ensuring the building design meets all applicable building codes and regulations, including fire safety, accessibility, and earthquake resistance.
8 Documentation and Communication: Creation of detailed design documents, including engineering drawings, specifications, and analysis reports, that serve as a guide for the construction process.

Building analysis design is a combination of engineering and art, requiring a deep understanding of civil engineering and architectural principles, as well as creativity to produce innovative and sustainable solutions.

2. LITERALUR REVIWE

2.1 Design

The word design is certainly familiar to the public because the use of design can be found, applied, and implemented in everyday life. According to Thabroni (2019), design is a creative activity to plan and design something that is functional and does not exist before with the aim of solving a problem so that it has more value and is useful for its users.
Meanwhile, according to Astuti (2020), design is a design process that starts from an idea or a problem and the process considers various aspects obtained from research and human thought.
Therefore, it can be concluded that design is a creative design process through an idea that is designed functionally to solve a problem based on research.
The world of design has various abstract and fairly broad understandings, but to produce a functional design, you must understand the principles of design to make it easier for a designer to unify compositions and combine elements into a design. 5 basic principles that need to be applied in a graphic design according to Kusnadi (2018, p.127-130), are:
1. Unity, is a basic principle of graphic design that is very important so that a design does not look messy, is orderly, and comfortable to look at and enjoy.
2. Balance, harmony obtained by creating scale, perspective effects, and points of view in the same condition. Balance is divided into 2 types; symmetrical balance (formal balance) and asymmetrical balance (informal balance).
3. Proportion, an ideal and harmonious comparison between objects by creating margins or distances.
4. Rhythm, regular and continuous repetition of movements or repetitions until they become a pattern.
5. Dominance / emphasis, a design must have a dominant object or element so that a message can be conveyed and read first and become the main focus.

2.2 structural analysis

Analysis is an activity that includes several activities. These activities include distinguishing, breaking down, and sorting to be included in certain groups to be categorized with certain goals, then looking for connections and then interpreting their meaning. According to the Big Indonesian Dictionary, "Analysis is the breakdown of a subject into its various parts and the study of the parts themselves and the relationships between the parts to obtain a proper understanding and understanding of the overall meaning". According to Nana Sudjana (2016:27) states "Analysis is an effort to sort out an integrity into elements or parts so that its hierarchy and arrangement are clear"
Gorys Keraf (2004:67) states "Analysis is a process of solving a problem into parts that are interrelated with each other". Likewise according to Abdul Majid (2013:54) "Analysis is the ability to break down units into separate units, divide units into sub- or parts, distinguish between two that are the same, and regarding differences

Table property material

Bahan	Berat Jenis, γ (kN/m^3)	Massa Jenis, ρ (kg/m^3)	Modulus Elastisitas, E (GPa)	Modulus Geser, G (GPa)	Rasio Poisson, v	Tegangan Leleh, σ_L (GPa)	Tegangan Ultimate, σ_U (GPa)	Koef. Termal, α (10^{-6}/°C)
Beton Biasa (Tekan)	23	2300	17-31		0.1-0.2		10-70	7-14
Beton Diperkuat (Tekan)	24	2400	17-31		0.1-0.2		10-70	7-14
Beton Ringan (Tekan)	11-18	1100-1800	17-31		0.1-0.2		10-70	7-14
Baja ASTM A36	77	7850	190-210	75-80	0.27-0.3	250	400	10-18
Baja ASTM A572	77	7850	190-210	75-80	0.27-0.3	340	500	10-18
Baja ASTM A514	77	7850	190-210	75-80	0.27-0.3	700	830	10-18

2.2.1 Structural Material Properties

In conducting an accurate analysis, very complete data is needed regarding the materials used. The data in question includes specific gravity, tensile strength, compressive strength, modulus of elasticity, poison ratio and others, where the material properties data are obtained through testing

In addition to the material properties, the strength of a structural element also depends on its dimensions and geometric shape. And of course the materials used must comply with applicable regulatory standards. The following regulations regulate the provisions for the use of steel and concrete in structural design, including:
1. SNI 2847-2013 Structural concrete requirements for building structures,
2. SNI 2052-2014 Concrete reinforcement steel
3. SNI 1729-2015 Specifications for structural steel buildings.

2.2.2 loading and structural properties

Another important element in structural analysis is the accuracy of the estimated load that is expected to burden the structure. Structural load is a force acting on a part of the structure, or on a structural system, which with structural analysis can be calculated how the flow and distribution of the force on each structural element that causes internal forces on the elements and at the same time calculate how much. By knowing the magnitude of the load that burdens a structural element and also knowing the strength of the element, it can be known whether or not an element is able to withstand the load that is working. In addition to the material properties of each element that makes up the structural system, the loading that works on the structure, of course the structural system will

affect the distribution of the load from the location of the load until it is finally distributed through the structural system to the foundation and the soil below.

2.3 Types of Construction Drawings

In a construction project there are several types of construction drawings. This is to avoid miscommunication for a planner and implementer. Not only that, the main goal is for the project to be carried out in accordance with the benefits and needs. The following are the types of construction drawings that are commonly used in the world of work.

3.1. Planning Drawing (As Plan Drawing)

Planning drawings or As Plan Drawings are drawings made by architects and assisted by detailed structural, mechanical and electrical engineer consultations including visible plans and sections (if necessary) and are often equipped with 3D drawings. Planning drawings contain the ideas of a planner which are intended as a communication tool for the planner to the owner or the person giving the task so that he knows to what extent the building to be planned meets his wishes and needs.

3. 2. Tender Drawing (Construction Bidding)

Tender drawings are drawings made after planning drawings. Tender drawings are more comprehensive than planning drawings because they complement tender documents containing job descriptions, technical specifications for auctions for contractors, so that all contractors can understand and calculate the volume and price analysis of a building to be built.

3.3 Construction Drawing

The next stage is the building construction drawing to start construction after selecting a contractor. This drawing is a refinement of the tender drawing which usually has differences between the job description, technical specifications and drawings. After being agreed upon during the tender, the changes are stated in this construction drawing. This drawing is a reference for the contractor to carry out the work and becomes the basis for third parties

3.4. Shop Drawing

The working drawing is made by the contractor or implementer as a reference for work in the field. Shop drawing or working drawing is a technical drawing in the field that is used as a reference for implementing a job. These drawings are detailed and become a guideline for the implementer or contractor in carrying out the work of a project.

3.5. As Built Drawing

The finished drawing or As Built Drawing is made by the contractor or implementer with the approval of the Service Provider/Owner. The finished drawing is a drawing made according to the conditions built in the field after adopting all changes that occur (specifications and drawings) during the construction process which shows the actual dimensions, geometry, and location of all project elements.

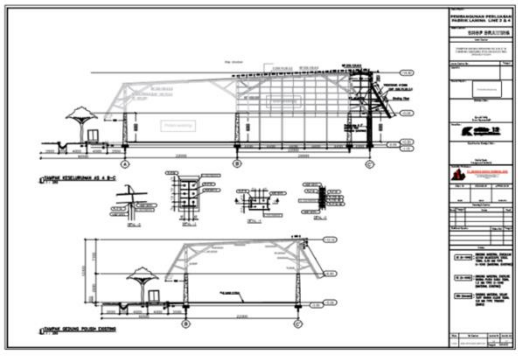
The purpose of this drawing is as a guideline for operating a building made from shop drawings which have adopted changes made during construction where these changes are specifically marked.

3. RESEARCH METODE

3.1. Overall Area View Drawing

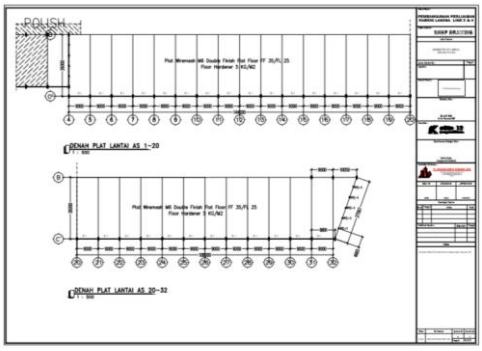
The overall project view drawing (site plan) has several important functions in the context of project construction and development. Here are some of the main functions of the overall project view drawing:

1. Site Planning and Mapping: The overall view drawing helps in planning the general layout of the entire project. This includes the placement of major buildings, access roads, parking areas, and other functional zones such as parks or public facilities.
2. Inter-Discipline Coordination: This drawing helps in coordination between technical disciplines involved in the project, such as architects, structural engineers, civil engineers, and others. This allows them to understand and adjust their designs according to the location that has been determined.
3. Reference for Permits and Licenses: The overall view drawing is often used to apply for the necessary permits and permits from local authorities. It shows how the project will impact the surrounding environment and whether it is in accordance with applicable zoning and city planning regulations.
4. Monitoring and Evaluation: As the project progresses, the overall view drawing is used as a reference to monitor the progress of the project. This helps in ensuring that construction is proceeding according to the initial plan and allows for evaluation of any potential changes or adjustments required.



3.2. Floor Plate Plan Image of Polish Area

The floor plate plan image in the polish area is intended to determine the coordinate points of the location of the floor plate casting work on the PT Surya Multi Cemerlang ceramic factory building expansion project carried out by PT Bangun Karya Perkasa Jaya.



3. Floor Dilation Image

Dilation in a building is a connection or line in a building that due to something has a different structural system with the intention of avoiding cracks in the building caused by vertical or horizontal impacts. For example, the effects of earthquakes, unstable soil, land shifts and so on.

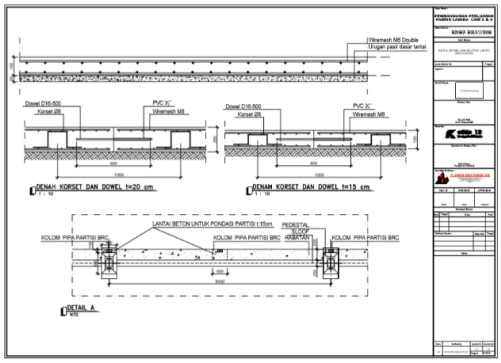
In dilation there are several models, namely Suppose there is a building that has different levels of pressure. Then the building that gets low pressure will have a different structure from the building that has higher pressure. Even in one building, for example a multi-storey one, the lower level has a stronger structure.

For example, there is a weak and strong soil structure in one building plan, then the foundation will be made according to the soil structure.

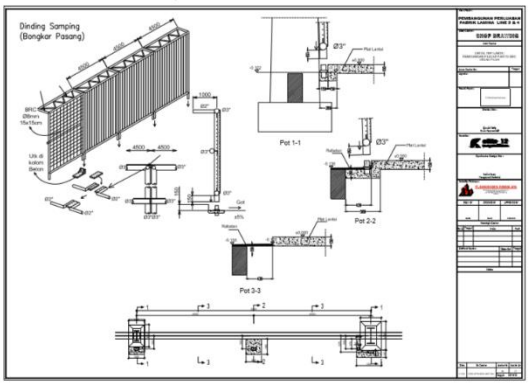
• Building dilation is usually applied to:
• Buildings that have different heights. (meeting between low and high buildings).
• Separator of the main building from the wing building.
• Buildings that have geometric weaknesses.
• Buildings that are >30m long.
• Buildings that stand on uneven ground.
• Buildings in earthquake areas.
• Buildings that have L, T, Z, O, H, and U building plans

3.4. Detailed Drawing

A detailed drawing is a drawing used to detail in detail related to dimensions, elevations, types of materials used, names of drawing elements and so on. Basically, this detailed drawing is a more detailed explanation with a smaller scale and scope of work to be understood by the implementer and workers.



Detailed drawing of floor dowels and dilation



Floor edge detail drawing

5. CONCLUSION

5.1. Conclusion

Design is a planning or design that is carried out before the creation of an object, system, component, or structure. Another opinion says that the meaning of design is the process of planning or designing an object that aims for the object created to have a function, have aesthetic value, and be useful for humans.

The designs required in floor work include:

1. Overall View Image of Polish Area
2. Floor Plate Plan Image of Polish Area
3. Floor Dilation Image
4. Detail Image

From the analysis that has been carried out, there is not a single structure that can withstand loads or forces exceeding its strength limit so that the floor plate structure is said to be safe to work on.

5.2. Suggestions

The suggestions that I can convey based on the results of observations of the Work Practice Internship (MPK) are as follows:

1. In the work process, it must be in accordance with the technical specifications and shop drawings that have been approved.
2. In design changes, it is best to immediately report them to the foreman and workers in the field

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